passing illumination along a plurality of different transmission paths through an interior portion of a material having a characteristic to be measured, said material having a surface;

defining each of said transmission paths by each transmission path optically transmissively connecting corresponding and separated surface areas on the surface of said material, one of said corresponding and separated surface areas optically transmissively connected to a first of said corresponding and separated areas for passing transmitted illumination into said material as a beginning of a first transmission path and a second of said corresponding and separated surface areas optically transmissively connected to a second of said corresponding and separated areas for passing transmitted illumination from said material for detection as an end of the first transmission path at said second of said corresponding and separated areas, at least one of said corresponding and separated surface areas of each of said transmission paths being extended in length as a ring shape or slit shape on said surface at substantially constant spacing from the other corresponding and separated surface area of said each of said paths, the total circumferential length of said ring or length of said slit shape [surface area of said each of said transmission paths] being substantially greater than the mean distance separating said corresponding and separated surface areas defining each of said transmission paths;

sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical information obtained from a spectrum related to analytes and interferences within said material in response to said illumination passing along different transmission paths, each signal corresponding to a particular transmission path; and

processing and combining said signals in accordance with appropriate chemometric modeling techniques and determination of model parameters during the calibration process to determine qualitative or quantitative characteristics of the material.

6. (AMENDED) A method for improving optical interactance measurements comprising the steps of:

passing illumination along a plurality of different transmission paths through an interior portion of a material having a characteristic to be measured, said material having a surface;

defining each of said paths by transmission path optically transmissively connecting corresponding and separated surface areas on said surface of said material, one of said surface areas optically transmissively connected to a first of said corresponding and separated areas for passing illumination into said material and the second of said surface areas optically transmissively connected to a second of said corresponding and separated areas for passing transmitted illumination from said material for detection, at least one of said surface areas of each of said paths having a dimension with a total length being extended in length at substantially constant spacing from a similar dimension of the other surface area of said each of said paths, the total length of said extended surface area of each of said paths being substantially greater than the distance separating said corresponding and separated surface areas defining each of said paths;

providing optical directionality for radiation passing through at least one of said extended surface areas by orienting the optical axes at the respective probe surface area at an angle with respect to the surface of said material and generally towards the said corresponding and separated surface area on said material;

sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical information obtained from within said material in response to said illumination passing along said different paths, each independent signal corresponding to a particular path, and

processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material.

7. (TWICE AMENDED) Apparatus for optical interactance measurements of an interior portion of a material having a surface, said

measurements being effected by passing illumination through portions of the material, said apparatus comprising:

apertures for defining corresponding and separated surface areas on said surface of said material for defining each of a plurality of transmission paths through an interior portion of said material, one of said corresponding and separated surface areas on the surface of said material optically transmissively connected to a first of said corresponding and separated areas for passing illumination into said material as beginning of a first transmission path and the second of said corresponding and separated surface areas on the surface of said material optically transmissively connected to a second of said corresponding and separated areas for passing illumination from said material for detection as an end of the first transmission path, at least one of said corresponding and separated surface areas of each of said transmission paths having a dimension that is [being] extended in length as a ring shape or slit shape on said surface of said material and said at least one of said corresponding and separated surface areas being substantially constantly spaced from its corresponding surface area, the total length of a circumference of said ring shape or length of slit shape area of each of said transmission paths being substantially greater than the mean distance separating said corresponding and separated surface areas on said surface of said material defining said each of said transmission paths;

illuminator for directing illumination onto said illumination surface areas and along said transmission paths;

sensor for sensing optical information indicative of said interior portion of said material developed by illumination passing along said transmission paths to said detection surface areas of said transmission paths;

signaler responsive to said sensing means, for developing a plurality of independent signals corresponding in number to said plurality of transmission paths, each of said signals representing said optical information obtained in a spectrum related to analytes and interferences within said material; and

processor for combining and processing said signals in accordance with appropriate chemometric modeling techniques and determination of model parameters during the calibration process to determine quantitative or qualitative characteristics of said material.

33. (TWICE AMENDED) A method for improving optical interactance measurements comprising the steps of:

passing illumination along a plurality of different transmssion paths through an interior portion of a material having a characteristic to be measured, said material having a surface;

defining each of said paths by corresponding and separated surface areas on said surface of said material, one of said corresponding and separated surface areas optically transmissively connected to a first of said corresponding and separated areas for passing transmitted illumination into said material as a first transmission path and a second of said corresponding and separated surface areas on the surface of said material optically transmissively connected to a second of said corresponding and separated areas for passing transmitted illumination from said material for detection as an end to said first path, at least one of said corresponding and separated surface areas of each of said transmission paths having a dimension that is [being] extended in total length as a circumference of a ring or a length of a slit at substantially constant spacing from the other corresponding and separated surface area of said each of said transmission paths, the total length of the circumference of the ring or length of the slit of said extended surface area of said each of said transmission paths being substantially greater than the mean distance separating said corresponding and separated surface areas defining each of said transmission paths, [an] the extended surface area of one of said transmission paths being contained within a boundary defined by an extended surface area of another of said transmission paths;

sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical information obtained from within said

material in response to said illumination passing along different transmission paths, each independent signal corresponding to a particular transmission path; and

processing and combining said signals in accordance with appropriate chemometric modeling techniques to determine qualitative or quantitative characteristics of the material.

36. (TWICE AMENDED) Apparatus for optical interactance measurements of an interior portion of a material having a surface, said measurements being effected by passing illumination along a plurality of different transmission paths through an interior portion of [a] the material having a characteristic to be measured, comprising:

an aperture operative to define each of said different transmission paths by corresponding and separated surface areas on said surface of said material, one of said corresponding and separated surface areas areas optically transmissively connected to a first of said corresponding and separated areas for passing illumination into said material and a second of said corresponding and separated surface areas on the surface of said material optically transmissively connected to a second of said corresponding and separated areas for passing illumination from said material for detection, at least one of said corresponding and separated surface areas of each of said transmission paths being extended in length as a circumference of a ring shape or length of a slit shape at substantially constant spacing from one other corresponding surface area, the total length of said circumference of said ring shape or length of said slit shape area of each of said transmission paths being substantially greater than the distance separating said corresponding and separated surface areas defining each of said paths, an extended surface area in the shape of a ring or slit of one of said paths being contained within a boundary defined by a surface area in the shape of a ring shape

or slit shape of another of said paths and being substantially surrounded by the extended surface area of said another of said paths;

illuminator for directing illumination onto said illumination surface areas and along said transmission paths;

sensor for sensing optical information indicative of said material developed by illumination passing along said transmission paths to said detection surface areas of said transmission paths;

signaler responsive to said sensing means, for developing a plurality of independent signals corresponding in number to said plurality of transmission paths, said signals representing said optical information obtained from within said material; and

processor for processing and combining said signals in accordance with appropriate chemometric modeling techniques to determine quantitative or qualitative characteristics of said material.

42. (AMENDED) The apparatus of claim 7 [or claim 36] wherein said aperture means are operative to define said illumination and sensing areas for at least one of said paths to be on opposite surfaces of said material.

Please add the following new claim:

72. A method for improving optical interactance measurements comprising the steps of:

passing illumination along at least one transmission path through an interior portion of a material having a characteristic to be measured, said material having a surface;

defining said at least one path by transmission path optically transmissively connecting corresponding and separated surface areas on said surface of said material, one of said surface areas optically transmissively connected to a first of said corresponding and separated areas for passing

illumination into said material and the second of said surface areas optically transmissively connected to a second of said corresponding and separated areas for passing transmitted illumination from said material for detection, at least one of said surface areas of said at least one path having a dimension with a total length being extended in length at substantially constant spacing from a similar dimension of the other surface area of said at least one path, the total length of said extended surface area of said at least one path being substantially greater than the distance separating said corresponding and separated surface areas defining said at least one path;

providing optical directionality for radiation passing through at least one of said extended surface areas by orienting the optical axes at the respective probe surface area at an angle with respect to the surface of said material and generally towards the said corresponding and separated surface area on said material;

sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical information obtained from within said material in response to said illumination passing along said at least one path, each independent signal corresponding to a particular path, and

processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material.

REMARKS

The above amendments are intended to directly respond to the issues raised in the Opinion of the Board of Appeals issuing a new ground of rejection under 35 USC 112, second paragraph, and as those grounds were restated in the Office Action mailed on 1 October 2002. That rejection is based upon a perceived lack of clarity in the language of the claims. The above amendments attempt to make a *bona fide* attempt to address and correct each of those issues.

It is to be noted that antecedent basis for the language used to amend the claims may be found generally in the concepts described in the specification and figures as originally filed. For example, the length of a ring is traditionally viewed as its circumference, all circles and rings having circumferences. The corresponding length of a slit is, of course, its length. Also, the